

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark  
Office  
(Box PCT)  
Crystal Plaza 2  
Washington, DC 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing: 10 June 1999 (10.06.99)	
International application No.: PCT/IB98/02032	Applicant's or agent's file reference: PAT 97321 PCT
International filing date: 03 December 1998 (03.12.98)	Priority date: 03 December 1997 (03.12.97)
Applicant: JOERESSEN, Olaf, J.	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:

14 April 1999 (14.04.99)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer:  J. Zahra Telephone No.: (41-22) 338.83.38
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# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:  
**NOKIA MOBILE PHONES LIMITED**  
 St. Georges Court  
 Attn. FRAIN, T.  
 St. Georges Road  
 Camberley  
 Surrey GU15 3QZ  
 UNITED KINGDOM

**PHI**

**NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION**

(PCT Rule 44.1)

**01 FEB 1999**

**DATE OF MAILING (day/month/year)** **24/02/1999**

Applicant's or agent's file reference <b>PAT 97321 PCT</b>	<b>FOR FURTHER ACTION</b> See paragraphs 1 and 4 below
International application No. <b>PCT/IB 98/02032</b>	International filing date (day/month/year) <b>03/12/1998</b>
Applicant <b>NOKIA MOBILE PHONES LIMITED et al.</b>	

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland  
 Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicants's request to forward the texts of both the protest and the decision thereon to the designated Offices.


☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority  
 European Patent Office, P.B. 5818 Patentlaan 2  
 NL-2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

**Hans Pettersson**

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

## INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

### What parts of the International application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

### What documents must/may accompany the amendments?

#### Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

**"Statement under article 19(1)" (Rule 46.4)**

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

**It must be in the language in which the international application is to be published.**

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

**Consequence if a demand for international preliminary examination has already been filed**

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

**Consequence with regard to translation of the international application for entry into the national phase**

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>PAT 97321 PCT</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IB 98/ 02032</b>	International filing date (day/month/year) <b>03/12/1998</b>	(Earliest) Priority Date (day/month/year) <b>03/12/1997</b>
Applicant <b>NOKIA MOBILE PHONES LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).

2. ☐ Unity of invention is lacking (see Box II).

3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

☐

filed with the international application.

☐

furnished by the applicant separately from the international application,

☐

but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐

Transcribed by this Authority

4. With regard to the title, ☒ the text is approved as submitted by the applicant

☐

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐

the text is approved as submitted by the applicant

☒

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

Figure No. 4

☐

as suggested by the applicant.

☐

because the applicant failed to suggest a figure.

☒

because this figure better characterizes the invention.

☐

None of the figures.

## Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The abstract is changed as follows:

Line 3: insert "(62)" after "means";  
line 4: insert "(40)" after "means";  
line 6: insert "(62)" after "means";  
line 8: insert "(40)" after "means".

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 98/02032

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 681 406 A (NOKIA MOBILE PHONES LTD) 8 November 1995  see abstract see column 5, line 2 - line 12 see column 9, line 2 - line 37 ---	1-4, 10-13, 21, 24, 25, 27-29
A	US 5 521 925 A (LI FAYU ET AL) 28 May 1996  see abstract see column 5, line 3 - line 39 see column 7, line 20 - line 56 see column 8, line 37 - column 9, line 11 see figure 3 --- -/--	1-4, 6, 7, 9-13, 21, 22, 24, 27, 29

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 February 1999

Date of mailing of the international search report

24/02/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Masche, C

## INTERNATIONAL SEARCH REPORT

International Application No

CT/IB 98/02032

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 41491 A (PACIFIC COMM SCIENCES INC) 19 December 1996 see abstract see page 3, line 7 - line 27 see page 15, line 34 - page 16, line 12 see page 22, line 22 - line 28 see figure 3 ---	1,5
A	EP 0 711 088 A (TELIA AB) 8 May 1996  see column 4, line 56 - column 5, line 10 see figure 4 -----	1,11-13, 24,25, 27-29



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 98/02032

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0681406	A	08-11-1995	FI 942038 A	04-11-1995
			AU 1785795 A	09-11-1995
			CN 1112346 A	22-11-1995
			US 5640395 A	17-06-1997
-----				
US 5521925	A	28-05-1996	NONE	
-----				
WO 9641491	A	19-12-1996	US 5819184 A	06-10-1998
-----				
EP 0711088	A	08-05-1996	NO 954372 A	08-05-1996
			SE 9403839 A	08-05-1996
-----				

**PCT****REQUEST**

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) PAT 97321PCT**Box No. I TITLE OF INVENTION**

INTEGRATING COMMUNICATIONS NETWORKS

**Box No. II APPLICANT**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

NOKIA MOBILE PHONES LIMITED  
KEILALAHDENTIE 4  
FIN 02150  
ESPOO  
FINLAND

☐ This person is also inventor.

Telephone No.

+358 24 3061

Facsimile No.

+358 24 3064 544

Teleprinter No.

State (that is, country) of nationality:

FINLAND

State (that is, country) of residence:

FINLAND

This person is applicant  
for the purposes of:☐ all designated  
States☒ all designated States except  
the United States of America☐ the United States  
of America only☐ the States indicated in  
the Supplemental Box**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

JOERESSEN OLAF J  
GEIBELSTR 30  
40235 DUSSELDORF  
GERMANY

This person is:

☐ applicant only☒ applicant and inventor☐ inventor only (If this check-box  
is marked, do not fill in below.)

State (that is, country) of nationality:

GERMANY

State (that is, country) of residence:

GERMANY

This person is applicant  
for the purposes of:☐ all designated  
States☐ all designated States except  
the United States of America☒ the United States  
of America only☐ the States indicated in  
the Supplemental Box☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf  
of the applicant(s) before the competent International Authorities as:

☒ agent☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

FRAIN, TIMOTHY JOHN MUIR, HENRY JOSEPH  
HAWS, HELEN LOUISE JEFFERY, KENDRA LOUISE  
HIBBERT, JULIET JANE GRACE HIGGIN, PAUL  
OF NOKIA MOBILE PHONES LIMITED, ST GEORGES COURT, ST  
GEORGES ROAD, CAMBERLEY, SURREY, GU15 3QZ, UNITED  
KINGDOM

Telephone No.

+44 1276 686 116

Facsimile No.

+44 1276 677 720

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

## Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

## National Patent (if other kind of protection or treatment desired, specify on dotted line):

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AL Albania                               | <input checked="" type="checkbox"/> LS Lesotho                                   |
| <input checked="" type="checkbox"/> AM Armenia                               | <input checked="" type="checkbox"/> LT Lithuania                                 |
| <input checked="" type="checkbox"/> AT Austria                               | <input checked="" type="checkbox"/> LU Luxembourg                                |
| <input checked="" type="checkbox"/> AU Australia                             | <input checked="" type="checkbox"/> LV Latvia                                    |
| <input checked="" type="checkbox"/> AZ Azerbaijan                            | <input checked="" type="checkbox"/> MD Republic of Moldova                       |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina                | <input checked="" type="checkbox"/> MG Madagascar                                |
| <input checked="" type="checkbox"/> BB Barbados                              | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria                              | <input checked="" type="checkbox"/> MN Mongolia                                  |
| <input checked="" type="checkbox"/> BR Brazil                                | <input checked="" type="checkbox"/> MW Malawi                                    |
| <input checked="" type="checkbox"/> BY Belarus                               | <input checked="" type="checkbox"/> MX Mexico                                    |
| <input checked="" type="checkbox"/> CA Canada                                | <input checked="" type="checkbox"/> NO Norway                                    |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> NZ New Zealand                               |
| <input checked="" type="checkbox"/> CN China                                 | <input checked="" type="checkbox"/> PL Poland                                    |
| <input checked="" type="checkbox"/> CU Cuba                                  | <input checked="" type="checkbox"/> PT Portugal                                  |
| <input checked="" type="checkbox"/> CZ Czech Republic                        | <input checked="" type="checkbox"/> RO Romania                                   |
| <input checked="" type="checkbox"/> DE Germany                               | <input checked="" type="checkbox"/> RU Russian Federation                        |
| <input checked="" type="checkbox"/> DK Denmark                               | <input checked="" type="checkbox"/> SD Sudan                                     |
| <input checked="" type="checkbox"/> EE Estonia                               | <input checked="" type="checkbox"/> SE Sweden                                    |
| <input checked="" type="checkbox"/> ES Spain                                 | <input checked="" type="checkbox"/> SG Singapore                                 |
| <input checked="" type="checkbox"/> FI Finland                               | <input checked="" type="checkbox"/> SI Slovenia                                  |
| <input checked="" type="checkbox"/> GB United Kingdom                        | <input checked="" type="checkbox"/> SK Slovakia                                  |
| <input checked="" type="checkbox"/> GE Georgia                               | <input checked="" type="checkbox"/> SL Sierra Leone                              |
| <input checked="" type="checkbox"/> GH Ghana                                 | <input checked="" type="checkbox"/> TJ Tajikistan                                |
| <input checked="" type="checkbox"/> GM Gambia                                | <input checked="" type="checkbox"/> TM Turkmenistan                              |
| <input checked="" type="checkbox"/> GW Guinea-Bissau                         | <input checked="" type="checkbox"/> TR Turkey                                    |
| <input checked="" type="checkbox"/> HR Croatia                               | <input checked="" type="checkbox"/> TT Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> HU Hungary                               | <input checked="" type="checkbox"/> UA Ukraine                                   |
| <input checked="" type="checkbox"/> ID Indonesia                             | <input checked="" type="checkbox"/> UG Uganda                                    |
| <input checked="" type="checkbox"/> IL Israel                                | <input checked="" type="checkbox"/> US United States of America                  |
| <input checked="" type="checkbox"/> IS Iceland                               | <input checked="" type="checkbox"/> UZ Uzbekistan                                |
| <input checked="" type="checkbox"/> JP Japan                                 | <input checked="" type="checkbox"/> VN Viet Nam                                  |
| <input checked="" type="checkbox"/> KE Kenya                                 | <input checked="" type="checkbox"/> YU Yugoslavia                                |
| <input checked="" type="checkbox"/> KG Kyrgyzstan                            | <input checked="" type="checkbox"/> ZW Zimbabwe                                  |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea |  |
| <input checked="" type="checkbox"/> KR Republic of Korea                     |  |
| <input checked="" type="checkbox"/> KZ Kazakhstan                            |  |
| <input checked="" type="checkbox"/> LC Saint Lucia                           |  |
| <input checked="" type="checkbox"/> LK Sri Lanka                             |  |
| <input checked="" type="checkbox"/> LR Liberia                               |  |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐ .....
- ☐ .....

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

<b>Box No. VI PRIORITY CLAIM</b>		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 3 DECEMBER 1997	9725659.8	GB		
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

Choice of International Searching Authority (ISA)  
(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA / EP

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

**Box No. VIII CHECK LIST; LANGUAGE OF FILING**

This international application contains the following number of sheets:

request : 3

description (excluding  
sequence listing part) : 14

claims : 5

abstract : 1

drawings : 5

sequence listing part  
of description :

Total number of sheets : 28

This international application is accompanied by the item(s) marked below:

1. ☐ fee calculation sheet

2. ☒ separate signed power of attorney

3. ☐ copy of general power of attorney; reference number, if any:

4. ☐ statement explaining lack of signature

5. ☐ priority document(s) identified in Box No. VI as item(s):

6. ☐ translation of international application into (language):

7. ☐ separate indications concerning deposited microorganism or other biological material

8. ☐ nucleotide and/or amino acid sequence listing in computer readable form

9. ☐ other (specify):

Figure of the drawings which  
should accompany the abstract: 5

Language of filing of the  
international application: ENGLISH

**Box No. IX SIGNATURE OF APPLICANT OR AGENT**

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

  
PAUL HIGGIN  
EUROPEAN PATENT ATTORNEY

3/12/98

For receiving Office use only		2. Drawings:  <input type="checkbox"/> received:  <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only
Date of receipt of the record copy by the International Bureau:

# PATENT COOPERATION TREATY PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>PAT 97321 PCT</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IB 98/ 02032</b>	International filing date (day/month/year) <b>03/12/1998</b>	(Earliest) Priority Date (day/month/year) <b>03/12/1997</b>
Applicant  <b>NOKIA MOBILE PHONES LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).

2. ☐ Unity of invention is lacking (see Box II).

3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.

☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the title, ☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

Figure No. 4 ☐ as suggested by the applicant.

☐ None of the figures.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

## Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The abstract is changed as follows:

Line 3: insert "(62)" after "means";  
line 4: insert "(40)" after "means";  
line 6: insert "(62)" after "means";  
line 8: insert "(40)" after "means".

## INTERNATIONAL SEARCH REPORT

International Application No

T/IB 98/02032

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 681 406 A (NOKIA MOBILE PHONES LTD) 8 November 1995  see abstract see column 5, line 2 - line 12 see column 9, line 2 - line 37 ---	1-4, 10-13, 21,24, 25,27-29
A	US 5 521 925 A (LI FAYU ET AL) 28 May 1996  see abstract see column 5, line 3 - line 39 see column 7, line 20 - line 56 see column 8, line 37 - column 9, line 11 see figure 3 --- -/-	1-4,6,7, 9-13,21, 22,24, 27,29

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18 February 1999

Date of mailing of the international search report

24/02/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
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Authorized officer

Masche, C

## INTERNATIONAL SEARCH REPORT

International Application No

T/IB 98/02032

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 41491 A (PACIFIC COMM SCIENCES INC) 19 December 1996 see abstract see page 3, line 7 - line 27 see page 15, line 34 - page 16, line 12 see page 22, line 22 - line 28 see figure 3 ---	1, 5
A	EP 0 711 088 A (TELIA AB) 8 May 1996  see column 4, line 56 - column 5, line 10 see figure 4 -----	1, 11-13, 24, 25, 27-29



# INTERNATIONAL SEARCH REPORT

ation on patent family members

International Application No

T/IB 98/02032

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0681406	A	08-11-1995	FI 942038 A	04-11-1995
			AU 1785795 A	09-11-1995
			CN 1112346 A	22-11-1995
			US 5640395 A	17-06-1997
-----				
US 5521925	A	28-05-1996	NONE	
-----				
WO 9641491	A	19-12-1996	US 5819184 A	06-10-1998
-----				
EP 0711088	A	08-05-1996	NO 954372 A	08-05-1996
			SE 9403839 A	08-05-1996
-----				

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

FRAIN, Timothy, John  
Nokia IPR Department  
Nokia House  
Summit Avenue  
Hampshire GU14 0NZ  
GRANDE BRETAGNE

PHI.

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
(PCT Rule 71.1)

Date of mailing  
(day/month/year)

04.04.2000

Applicant's or agent's file reference  
PAT 97321 PCT

## IMPORTANT NOTIFICATION

International application No.  
PCT/IB98/02032

International filing date (day/month/year)  
03/12/1998

Priority date (day/month/year)  
03/12/1997

Applicant  
NOKIA MOBILE PHONES LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office  
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Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
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Authorized officer

Cremona, P

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# PATENT COOPERATION TREATY

## PCT



### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>PAT 97321 PCT</b>		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. <b>PCT/IB98/02032</b>	International filing date ( <i>day/month/year</i> ) <b>03/12/1998</b>	Priority date ( <i>day/month/year</i> ) <b>03/12/1997</b>
International Patent Classification (IPC) or national classification and IPC <b>H04Q7/22</b>		
Applicant <b>NOKIA MOBILE PHONES LIMITED et al.</b>		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 8 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 4 sheets.

- This report contains indications relating to the following items:
  - ☒ Basis of the report
  - ☐ Priority
  - ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - ☒ Lack of unity of invention
  - ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Certain documents cited
  - ☒ Certain defects in the international application
  - ☒ Certain observations on the international application

Date of submission of the demand  <b>14/04/1999</b>	Date of completion of this report  <b>04.04.2000</b>
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office</b> <b>D-80298 Munich</b> <b>Tel. +49 89 2399 - 0 Tx: 523656 epmu d</b> <b>Fax: +49 89 2399 - 4465</b>	Authorized officer  <b>Hodgins, W</b>  Telephone No. <b>+49 89 2399 8987</b>  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB98/02032

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1-14 as originally filed

**Claims, No.:**

1-3,5,6,8-10,12, as originally filed  
13,15-33

4,7,11,14 as received on 26/11/1999 with letter of 23/11/1999

**Drawings, sheets:**

1/5-5/5 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB98/02032

- ☒ claims Nos. 30.

because:

- ☒ the said international application, or the said claims Nos. 30 relate to the following subject matter which does not require an international preliminary examination (*specify*):

**see separate sheet**

- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

- ☐ no international search report has been established for the said claims Nos. .

**IV. Lack of unity of invention**

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.  
☐ paid additional fees.  
☐ paid additional fees under protest.  
☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.  
☒ not complied with for the following reasons:

**see separate sheet**

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB98/02032

- ☒ all parts.  
☐ the parts relating to claims Nos. .

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-29, 31-33
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-29, 31-33
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-29, 31-33
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB98/02032

**Concerning Point III**

Claim 30 is not allowable under Rule 6.2(a) PCT, and should accordingly have been deleted.

**Concerning Point IV**

Claims 1 - 29 relate to terminals (or networks comprising such terminals) for simultaneously operating in a first mobile radio communications network and a second different radio communications network comprising first and second transceiver means with various features.

Claims 31 - 33 relate to radio communications systems with slots of particular durations.

No inventive concept links the above two groups of claims. Accordingly, the requirements of Rule 13.1 PCT with regard to unity of invention are not met.

**Concerning Point V**

- 1) The following documents from the search report are cited:  
D1: EP-A-0 681 406 (NOKIA MOBILE PHONES LTD) 8 November 1995  
D2: US-A-5 521 925 (LI FAYU ET AL) 28 May 1996  
D3: WO 96 41491 A (PACIFIC COMM SCIENCES INC) 19 December 1996  
D4: EP-A-0 711 088 (TELIA AB) 8 May 1996

Additionally, the document US-A-4 763 322 is cited as D5. This document is mentioned in the introductory part of D4 and was attached to the written opinion with date of mailing 23.08.99 as an annex.

- 2) Claim 1 relates to a terminal for simultaneously operating in a first mobile radio communications network and a second different radio communications network.

The first network could be, for example, a mobile phone network and the second, for example, a LPRF network.

It is known, for example, from D3, that the integration of a digital packet system with an analog cellular system may be desirable. However, this document is less interested in a terminal capable of operating in both modes. It is further noted that this document rather discloses a manner of adding data transmission to AMPS in such a way that this is transparent to the AMPS system.

The current application relates rather to an all digital system, ie the integration of LPRF with, for example, GSM or D-AMPS. A problem with the desire to devise a terminal capable of operating in two such digital systems using time slots is that the two transceivers may interfere with each other if they both transmit at the same time. This is overcome by arranging the time slot length used by the second transceiver dependent upon the frame length used by the first transceiver.

This in particular is neither known nor derivable from the prior art or its various combinations, so that claim 1 meets all the requirements of Articles 33(1) - (4) PCT with regard to novelty, inventive step and industrial applicability.

- 3) Owing to their dependencies upon claim 1, dependent claims 2 - 29 also meet all the requirements of Articles 33(1) - (4) PCT with regard to novelty, inventive step and industrial applicability.
- 4) With respect to independent claims 31 and 33, any TDMA document (for example D1, D2, D4 - see abstracts and / or passages cited in search report) discloses a radio communications system comprising a plurality of transceivers synchronised to a common time frame having a succession of equal time slots wherein a single transceiver transmits in (any) one time slot.

The remaining feature of claim 31 is that the duration of the time slot is programmable. This (taken with the above features) means that the time slot duration is fixed within a frame, but alterable. D5 (see abstract) teaches that the base station may vary the duration of time slots in a frame, dependent on the bandwidth requirements of a particular mobile station. However, this feature of time slots fixed within a frame, but programmable, (ie presumably variable between frames) is neither known nor derivable from the prior art or its combinations.



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB98/02032

Claim 31 accordingly meets the requirements of Articles 33(1) - (4) PCT with regard to novelty, inventive step and industrial applicability.

Dependent claim 32, and independent claim 33 (which comprises the amalgam of claims 31 and 32) thus also meet the requirements of Articles 33(1) - (4) PCT with regard to novelty, inventive step and industrial applicability.

**Concerning Point VII**

- 1) The independent claims should have been put in the two part form recommended by Rule 6.3(b) PCT with a pre-characterising part reflecting the teachings of the closest prior art.

If, however, the applicant were of the opinion that the two-part form would be inappropriate, then reasons therefor should have been provided. In addition, the applicant should have ensured that it is clear from the description which features of the subject-matter of the independent claims are known from the prior art (cf. the PCT Guidelines PCT/GL/3 III 2.3a).

- 2) In order to meet the requirements of Rule 6.2(b) PCT reference signs in parenthesis should have been added to the claims. This applies both to the preamble and to the characterising part, and to method claims in as far as they refer to apparatus features.
- 3) In order to meet the requirements of Rule 5.1(a)(ii) PCT, at least the documents D3 (teaching the integration of a digital packet system with an analog cellular system) and D5 should have been cited in the description and briefly discussed.

Alternatively, if the applicant were aware of a document disclosing the art mentioned in the introductory part of the description, such a document should have been explicitly named. A copy of such a document should preferably also have been provided for the office.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB98/02032

**Concerning Point VIII**

- 1) Claims 27 and 28 are not adequately supported by the description, contrary to the requirements of Article 6 PCT. Firstly, these claims claim a "third mobile radio communications network". In particular, claims 27 and 28 claim "the third transceiver". Not only is such a third transceiver nowhere previously defined in the claims, it is also nowhere described in the description.
- 2) Claim 2 should be dependent upon claim 1, not "any preceding claim".

Figure 10 illustrates how the common time frame of the LPRF communications system can be shifted.

Figure 1 illustrates a network 2 of radio transceiver units, including a master unit 4 and slave units 6, 8 and 10, communicating by transmitting and receiving radio packets. The master unit is the transceiver unit which initiates the connection of a slave to the network. There is only one master in a network. Referring to Figure 2, the transceiver units are synchronised to a common time frame 20 for the network controlled by the master unit 4. This time frame consists of a series of time slots 22-29 of equal length  $T$ . Each radio packet transmitted in the network has its start aligned with the start of a slot and a single packet is transmitted in the network at a time.

When the master unit is performing point-to-point communication a transmitted radio packet is addressed to a particular transceiver which may reply to the master unit by transmitting a radio packet addressed to the master unit in a following time slot. Any time misalignment between the master and a slave is corrected by adjusting the timing of the slave so that it corresponds to that of the master unit 4.

20

The transceivers transmit and receive, in this example, in a microwave frequency band, illustratively 2.4 GHz. The network reduces interference by changing the frequency at which each radio packet is transmitted. A number of separate frequency channels are assigned each with a bandwidth of 1MHz, and the frequency may hop once every time slot at a rate of  $f$  hops/s. The frequency hopping of the transceivers communicating in or joining the network is synchronised and controlled by the master unit. The sequence of hopping frequencies is unique for the network and is uniquely determined by the master unit. Although each slot is allocated a different one of a sequence of hopping frequencies it is possible for a radio packet to extend over a number

30

Data to be transmitted in the payload of a packet by the transceiver unit 40 is supplied as data signal 41 to the packetiser 42 or as control information from the controller 60. This control information may define the length of a super-frame and the allocation pattern for the super-frame. The packetiser 42 places  
5 the data or control information into a packet which is addressed to a particular unit and supplied as signal 43 to the transmitter 44. The transmitter 44 modulates a carrier wave in dependence upon the transmission frequency control signal 47 supplied by the controller. The frequency of the carrier wave is controlled to be one of a sequence of hop frequencies by the transmission  
10 frequency control signal 47, which also controls the timing of the transmission.

The antenna 46 receives a radio signal 51 and supplies it to the receiver 50 which demodulates the radio signal 51 under the control of a reception frequency control signal 49 supplied by the controller 60 to produce a digital  
15 signal 53. The digital signal 53 is supplied to the synchroniser/decoder 54. The synchroniser accepts those received radio packets addressed to the transceiver 40 and rejects those received radio packets that are not addressed to the transceiver 40. The synchroniser/decoder 54 in combination with the controller 60 synchronises the transceiver unit 40 to the time frame of  
20 the LPRF network. The controller compares the time at which a radio packet was received with the time at which the radio packet was expected to be received and shifts its timing to offset the difference. The synchroniser/decoder 54 also decodes the received packet. If the transceiver is a slave unit any control information in the packet is supplied to the controller  
25 60 and any data in the packet is provided as data output signal 57. The control information including the length of a slot, the length of a super-frame and the pattern allocation is stored in the memory 56.

The frequency at which the transceiver 40 transmits or receives cycles or  
30 hops through a sequence of frequencies, with one hop per slot. The

If  $l$  is given (eg  $l=0.625$  ms as in Bluetooth) searching for the smallest possible  $\alpha, \beta, N', N$  (with even  $N', N$ ) yields:  $\alpha=13, \beta=1, N'=32, N=96=3 \cdot N'$

- 5 Referring to Figure 5 the LPRF network 2 is configured to use slot lengths of this length by the mobile terminal 100. The master and slave units are configured. Referring to Figure 4, the control unit 80 via the phone unit 62 identifies the mobile network. It then determines the value of  $l$  and the size of the super-frame, or if  $l$  is predetermined and fixed, determines the size of the super-frame. Thus the slot length used by the mobile terminal in the LPRF network may be fixed permanently or may be varied in the future when the mobile terminal moves into different mobile network environments.

- 15 The control unit also determines suitable allocation patterns for the super-frame. The allocation patterns and the super-frame size are then provided to the transceiver unit 40. This transceiver unit acts as a master unit in the LPRF network. Its activity is controlled by the parameters: super-frame size, slot length  $l$  and the allocation patterns. The master also transmits the super-frame size and allocation patterns to the slave units. The slot length  $l$  will also be transmitted if it is not fixed for the network. Thus all the units in the LPRF network have the necessary parameters to synchronise with the mobile network.

- 25 The terminal 100 acts as an interface between the mobile and LPRF networks and it operates simultaneously in both. However, concurrent activities and especially concurrent transmission by the mobile terminal 100 in the mobile network 106 and in the LPRF network 2 may cause interference and type approval difficulties. The communication of the base station 102 and the mobile terminal 100 in the mobile network is controlled by the base station.
- 30 The communication of the mobile terminal (master unit) 100 with the slave

of LPRF time slots per D-AMPS or PDC time frame is 26 labelled 1 to 26 in the Figure. Transmission (down-link, D) in the LPRF network by the mobile terminal during slots 18 to 26 is forbidden. In this allocation pattern, the mobile terminal is able to transmit and receive in the LPRF network slots 1 to 17 and  
5 to receive only in slots 18 to 26.

Figure 10 illustrates how the LPRF timing readjust to a change in the timing of the mobile network. In this example the mobile time slot in which the mobile terminal transmits in the mobile network changes from slot 3 to slot 6. This  
10 may occur for example when the mobile terminal is handed over by one base station to another in the mobile network. The resynchronisation of mobile and LPRF networks is achieved by the cellular circuitry 62 informing the control unit 80 which in turn changes the timing of the master transceiver 40 in the mobile terminal 100. The super-frame is shifted by an integer number of LPRF  
15 time slots but the allocation pattern within the super-frame remains unchanged and shifts with the super-frame.

Although a particular implementation of the invention has been described it should be appreciated that the implementation may be varied without  
20 departing from the scope of the invention as defined by the claims. In particular the invention is not limited to the particular mobile networks and LPRF network described nor are the allocation patterns limited to the patterns described.

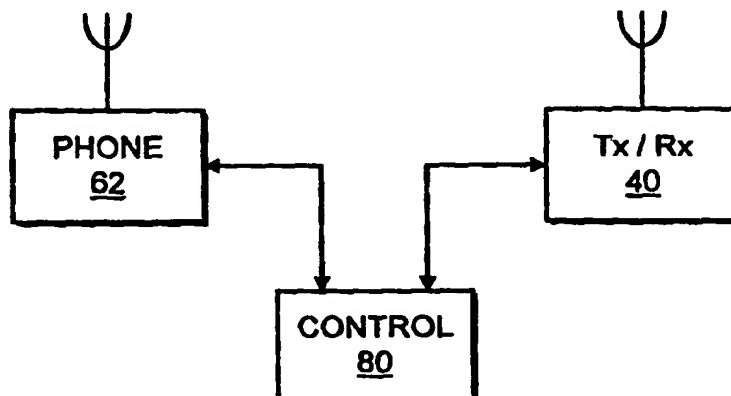


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>H04Q 7/22</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/29126</b> <b>(43) International Publication Date:</b> 10 June 1999 (10.06.99)
<b>(21) International Application Number:</b> PCT/IB98/02032 <b>(22) International Filing Date:</b> 3 December 1998 (03.12.98) <b>(30) Priority Data:</b> 9725659.8 3 December 1997 (03.12.97) GB <b>(71) Applicant (for all designated States except US):</b> NOKIA MOBILE PHONES LIMITED [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> JOERESSEN, Olaf, J. [DE/DE]; Geibelstrasse 30, D-40235 Düsseldorf (DE). <b>(74) Agents:</b> FRAIN, Timothy, John et al.; Nokia IPR Dept., Nokia House, Summit Avenue, Farnborough, Hampshire GU14 ONZ (GB).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** INTEGRATING COMMUNICATIONS NETWORKS**(57) Abstract**

A terminal for simultaneously operating in a first mobile radio communications network and a second different radio communications network. The terminal comprises: first radio transceiver means (62) for transmitting and receiving in said mobile communications network and second radio transceiver means (40) for transmitting and receiving packets in the second radio communications network. The first transceiver means (62) is arranged such that successive transmissions by said first transceiver means in said mobile communications network are separated by a first period of time or a multiple thereof. The second transceiver (40) means is arranged for transmitting and/or receiving an integer number of packets sequentially in the first period of time or a multiple thereof.



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**INTEGRATING COMMUNICATIONS NETWORKS.**

- 5 The present invention relates to the integration of two different communications networks. It particularly relates to a terminal which can be operate simultaneously in both networks.

Existing mobile communication networks have protocols which rigidly define  
10 specific parameters. For example, the GSM, D-AMPS and PDC networks operate using time division multiplexing (TDMA). For each frequency channel, a TDMA time frame is defined. The TDMA time frame has a fixed number of time slots of fixed duration and each time slot represents a channel through which a mobile terminal and a base station communicate. A particular  
15 terminal uses a time slot to transmit a message to the base station once per time frame and the base station uses another slot to transmit a message to the particular terminal once per time frame. The TDMA time frames are cyclically repeated one after the other.

20 The characteristics of the time frame vary from network to network. In the GSM network, the time frame is divided into eight time slots and each frame has a duration of 60/13 ms. In the D-AMPS and PDC networks, the time frame is divided into 3 slots, and each frame has a duration of 20 ms.

25 Other types of radio communications networks are proposed. One such network is the Bluetooth low power radio frequency (LPRF) network described at <http://www.bluetooth.com>. This communications network is proposed to obviate the need for physical electrical connections between electrical devices.

It would be desirable to integrate the new or proposed communications networks with an existing communications network or networks.

According to one aspect of the present invention there is provided a terminal  
5 in a mobile radio communications network, as claimed in claim 1.

The timing of the second radio communications network is such that the timing of the mobile communications network and the timing of the second radio communications network can be aligned. This allows the two networks  
10 to be easily integrated through the terminal.

The terminal can simultaneously operate in both networks by transmitting or receiving in one network while simultaneously transmitting or receiving in the other network.

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The second transceiver means defines a super-frame having said integer number of slots and a slot allocation pattern for each connection. The allocation patterns define what each slot in the super-frame is used for. The super-frame has a finite length and is cyclically repeated. The allocation  
20 pattern has the same finite length and is repeated with the super-frame. The finite length may be fixed or variable. The allocation pattern is preferably variable. The second communications network is preferably controlled using allocation patterns by transmitting one to each of the other transceivers in the network. The slot length in the second communications network may be fixed  
25 or variable.

The terminal by defining the allocation pattern is capable of avoiding critical concurrent activities by the terminal in the first and second communication networks. This supports integration of the first and second networks, eases  
30 type approval and simplifies RF design. The critical concurrent activities may

be predefined in the terminal. They are typically those activities which are difficult or impossible to handle concurrently. One example may be simultaneous transmission in both networks another may be simultaneous reception in both networks.

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For a better understanding of the present invention and to understand how the same may be brought into effect, reference will now be made by way of example only to the following drawings in which:

Figure 1 illustrates an LPRF communications network including master and  
10 slave units;

Figure 2 illustrates the common time frame of the LPRF communications network;

Figure 3 illustrates a transceiver suitable for use as a master unit or a slave unit;

15 Figure 4 illustrates a mobile terminal for simultaneously operating in two communications networks;

Figure 5 illustrates the integration of a mobile communications network and an LPRF communications network via the mobile terminal of Figure 4;

Figure 6 illustrates the time frame used in the mobile communications  
20 network;

Figure 7 illustrates the allocation of LPRF time slots in an LPRF communications network integrated with a first GSM mobile communications network;

Figure 8 illustrates the allocation of LPRF time slots in an LPRF  
25 communications network integrated with a second GSM mobile communications network;

Figure 9 illustrates the allocation of LPRF time slots in an LPRF communications network integrated with a PDC or D-AMPS mobile communications network; and

Figure 10 illustrates how the common time frame of the LPRF communications system can be shifted.

Figure 1 illustrates a network 2 of radio transceiver units, including a master unit 4 and slave units 6, 8 and 10, communicating by transmitting and receiving radio packets. The master unit is the transceiver unit which initiates the connection of a slave to the network. There is only one master in a network. Referring to Figure 3, the transceiver units are synchronised to a common time frame 20 for the network controlled by the master unit 4. This time frame consists of a series of time slots 22-29 of equal length  $T$ . Each radio packet transmitted in the network has its start aligned with the start of a slot and a single packet is transmitted in the network at a time.

When the master unit is performing point-to-point communication a transmitted radio packet is addressed to a particular transceiver which may reply to the master unit by transmitting a radio packet addressed to the master unit in a following time slot. Any time misalignment between the master and a slave is corrected by adjusting the timing of the slave so that it corresponds to that of the master unit 4.

20

The transceivers transmit and receive, in this example, in a microwave frequency band, illustratively 2.4 GHz. The network reduces interference by changing the frequency at which each radio packet is transmitted. A number of separate frequency channels are assigned each with a bandwidth of 1MHz, and the frequency may hop once every time slot at a rate of  $f$  hops/s. The frequency hopping of the transceivers communicating in or joining the network is synchronised and controlled by the master unit. The sequence of hopping frequencies is unique for the network and is uniquely determined by the master unit. Although each slot is allocated a different one of a sequence of hopping frequencies it is possible for a radio packet to extend over a number

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of slots and in this case the frequency at which the packet is transmitted remains constant at that allocated to the slot at the start of the packet.

The network is a radio frequency network suitable for transmitting voice information or data information between transceivers. The transmissions made are of low power, for example 0 to 20dBm, and the transceiver units can effectively communicate over the range of a few centimetres to a few tens or hundred of metres. The master unit identifies the other transceiver units within its transmission range and sets up a communication link between the master unit and that slave unit.

An allocation pattern is defined for each connection in the network. This allocation pattern defines whether a slot is used or not. If the slot is used it defines how the slot is used. Possibilities for using slots may include that a slot is:

- a down-link slot (D);
- an up-link slot (U);
- a continuation slot (ie a slot in which the activity of the previous slot may be continued e.g. to transmit packets that extend over several slots) (C);
- an unused slot (-);
- a slot with the property above but fixedly reserved for a certain connection (F).

Up-link is transmission from the slave unit to the master unit and down-link is transmission from the master unit to a slave unit. An example of two allocation patterns is:

Slot No	Pattern 1 for Slave Unit 6	Pattern 2 for Slave Unit 8
0	D	D
1	U	U

		6
2	D F	-
3	D C F	-
4	U F	-
5	U C F	-
5		

- The allocation patterns have a finite length of six slots in this example and are cyclically repeated until changed. The collection of slots to which each of the allocation patterns are applied, in this case six slots, form a super-frame. The master uses radio packets to supply control information to the slave units.
- 10 This control information controls the size of the super-frame and the allocation patterns for the super-frame used by each of the slave units.

- In the example slave unit 6 may be active at any slot. Slots 3 and 5 are marked as continuation slots, thus packets that extend over two slots starting
- 15 in slot 2 and 4 can be used. Furthermore, slots 2 to 5 are fixedly reserved for slave unit 6 providing a guaranteed capacity to this slave. Slots 0 and 1 are shared with the connection to slave unit 8. Slave unit 8 may save power by ignoring the traffic in the slots 2 to 5 completely.

- 20 Referring to Figure 3, a schematic illustration of a transceiver unit 40 is shown. This transceiver unit may function as a slave or a master unit. Only as many functional blocks and interconnections are shown in this diagram as are necessary to explain in the following how a transceiver unit and the communication network operates. The transceiver unit 40 contains a number
- 25 of functional elements including: an antenna 46, receiver 50, synchroniser/packet decoder 54, controller 60, memory 56, packetiser 42 and transmitter 44. Although these elements are shown as separate elements they may in fact be integrated together and may be carried out in software or in hardware.

Data to be transmitted in the payload of a packet by the transceiver unit 40 is supplied as data signal 41 to the packetiser 42 or as control information from the controller 60. This control information may define the length of a super-frame and the allocation pattern for the super-frame. The packetiser 42  
5 places the data or control information into a packet 30 which is addressed to a particular unit and supplied as signal 43 to the transmitter 44. The transmitter 44 modulates a carrier wave in dependence upon the transmission frequency control signal 47 supplied by the controller. The frequency of the carrier wave is controlled to be one of a sequence of hop frequencies by the transmission  
10 frequency control signal 47, which also controls the timing of the transmission.

The antenna 46 receives a radio signal 51 and supplies it to the receiver 50 which demodulates the radio signal 51 under the control of a reception frequency control signal 49 supplied by the controller 60 to produce a digital  
15 signal 53. The digital signal 53 is supplied to the synchroniser/decoder 54. The synchroniser accepts those received radio packets addressed to the transceiver 40 and rejects those received radio packets that are not addressed to the transceiver 40. The synchroniser/decoder 54 in combination with the controller 60 synchronises the transceiver unit 40 to the time frame of  
20 the LPRF network. The controller compares the time at which a radio packet was received with the time at which the radio packet was expected to be received and shifts its timing to offset the difference. The synchroniser/decoder 54 also decodes the received packet. If the transceiver is a slave unit any control information in the packet is supplied to the  
25 controller 60 and any data in the packet is provided as data output signal 57. The control information including the length of a slot, the length of a super-frame and the pattern allocation is stored in the memory 56.

The frequency at which the transceiver 40 transmits or receives cycles or  
30 hops through a sequence of frequencies, with one hop per slot. The

- frequency  $f$  of the hopping is the inverse of the slot length  $l$ . The transmission frequency control signal 47 and the reception frequency control signal 49 respectively control the transmitter 44 and the receiver 50. A slave unit emulates the timing of the master unit. The sequence of frequencies through which the hopping cycles is dependent upon the master unit. The position within the cycle is dependent upon the emulated time. The transmission frequency control signal 47 and the reception frequency control signal 49 also control when and for how long the transceiver is receiving or transmitting
- 5
- 10 The controller 60 in a master transceiver unit defines the allocation patterns by allocating time slots in the common LPRF time frame. It controls the slaves via transmitted control information including the allocation pattern. Figure 5 illustrates the integration of the LPRF communications network 2 previously illustrated in Figure 1 with a mobile radio communications network 106. The
- 15 mobile network 106 comprises a base station (BTS) 102 and a plurality of mobile terminals (MT) one 100 of which is illustrated. The mobile network 106 is a conventional network such as GSM, DCS 1800, D-AMPS or PDC. The mobile terminal 100 transmits to the base station (up-link, U) and receives from the base station (down-link, D) in the manner defined by the network and
- 20 known to those skilled in the art. The mobile terminal 100 also simultaneously functions as a master transceiver in the LPRF communications network 2. The mobile terminal 100 transmits to the slave units (down-link, D) and receives from the slave units (up-link, U) in the manner previously described. Thus the mobile terminal is an interface and can interact in both the mobile
- 25 network 106 and the LPRF network 2.

Referring to Figure 4, the mobile terminal 100 is illustrated. The mobile terminal 100 has a transceiver 40 for use in the LPRF network 2, a cellular phone unit 62 which allows it to communicate in the mobile network 106 and a

30 control unit 80. The transceiver unit 40 was previously described in



connection with Figure 3. The cellular phone unit 62 functions as a normal cellular phone and controls the activity of the terminal 100 in the network 106. The control unit 80 controls the integration of the mobile network 106 and the LPRF network 2. Although in this figure the cellular phone unit 62, the control unit 80 and the transceiver 40 are shown as separated units they may in fact share common resources such as hardware interfaces, processors especially DSP, and memory or be integrated as a single unit. Thus the controller 60 in transceiver 40 may also function as the control unit and provide resources to the phone unit 62. Resource conflict may arise in this instance and the allocation patterns for the LPRF network may be defined to avoid such conflict.

The mobile network 106 is typically a TDMA network. Figure 6 illustrates the common timing system 110 used in the mobile network. The system cyclically repeats a time frame as time frames 112 and 114 etc.. Each of the mobile time frames 112 and 114 are subdivided into mobile time slots 116, 118, 120 ...130 each having a length L. Each mobile slot is used for the transmission of a message from a mobile terminal to a base station or from a base station to a mobile terminal. The terminal 100 in the mobile network 106 will generally transmit one message and receive one message each frame. The remaining slots are used by other mobile terminals.

In the GSM network the frame size is 60/13 ms and there are 8 time slots per frame. In the D-AMPS and PDC networks the frame size is 20 ms and there are 3 time slots per frame

The LPRF slot length used by the mobile terminal 100 is chosen so that synchronisation between the mobile network and the LPRF network is possible. The length / of the LPRF time slot is chosen so that a whole number of LPRF time slots fit into one time frame of the mobile network 106 or a

multiple number of such time frames. A super-frame in the LPRF network will have this whole number of slots. Consequently when a super-frame is cyclically repeated in the LPRF network, the relationship between the slots of the LPRF network and the slots of the mobile network is specified. The beginning of each super-frame is preferably aligned with the beginning of a time frame in the mobile network.

The mobile terminal may be adapted or adaptable to operate in two different mobile networks which use different mobile frame lengths. The length of the LPRF time slot is chosen so that a whole number of time slots fit into one time frame of the mobile network 106 or a multiple thereof, irrespective of the size of the time frame of the mobile network i.e. irrespective of whether it is GSM or alternatively PDC or D-AMPS.

If  $N$  LPRF time slots of size  $l$  fit into  $\alpha$  GSM frames of size  $L$  and  $N'$  LPRF time slots of size  $l$  fit into  $\beta$  PDC or D-AMPS time frames of size  $L'$  then, because  $L=60/13$  ms and  $L'=20$ ms:

$$l = (60/13) \times (\alpha/N) = (20) \times (\beta/N')$$

The value  $l$  represents the size of a slot in the LPRF network. The value  $N$  represents the size of a super-frame in the LPRF network when it is integrated with a GSM mobile network. The value  $N'$  represents the size of a super-frame in the LPRF network when it is integrated with a D-AMPS or PDC mobile network. It should be appreciated that the size of the slot  $l$  may vary if for example the mobile terminal operates in a mobile network of another type with a different size of slot.

To reduce packet overhead it is preferable to have  $l$  as large as possible. It is also preferable to have an even number of LPRF time slots per mobile time frame thus allowing pairs of up-link and down-link activities.

If  $l$  is given (eg  $l=0.625$  ms as in Bluetooth) searching for the smallest possible  $\alpha, \beta, N', N$  (with even  $N', N$ ) yields:  $\alpha=13, \beta=1, N'=32, N=96=3*N$

- 5 Referring to Figure 5 the LPRF network 2 is configured to use slot lengths of this length by the mobile terminal 100. The master and slave units are configured. Referring to Figure 4, the control unit 80 via the phone unit 62 identifies the mobile network. It then determines the value of  $l$  and the size of the super-frame, or if  $l$  is predetermined and fixed, determines the size of the
- 10 super-frame. Thus the slot length used by the mobile terminal in the LPRF network may be fixed permanently or may be varied in the future when the mobile terminal moves into different mobile network environments.

- The control unit also determines suitable allocation patterns for the super-
- 15 frame. The allocation patterns and the super-frame size are then provided to the transceiver unit 40. This transceiver unit acts as a master unit in the LPRF network. Its activity is controlled by the parameters: super-frame size, slot length  $l$  and the allocation patterns. The master also transmits the super-frame size and allocation patterns to the slave units. The slot length  $l$  will also
- 20 be transmitted if it is not fixed for the network. Thus all the units in the LPRF network have the necessary parameters to synchronise with the mobile network.

- The terminal 100 acts as an interface between the mobile and LPRF networks
- 25 and it operates simultaneously in both. However, concurrent activities and especially concurrent transmission by the mobile terminal 100 in the mobile network 106 and in the LPRF network 2 may cause interference and type approval difficulties. The communication of the base station 102 and the mobile terminal 100 in the mobile network is controlled by the base station.
- 30 The communication of the mobile terminal (master unit) 100 with the slave

units in the LPRF network is controlled by the mobile terminal (master unit) 100 as previously described. The LPRF network may be controlled by the mobile terminal acting as a master unit to maintain synchronisation of the two networks and to prevent simultaneous transmission by the mobile terminal 5 100 in the two networks. The controller 60 in the mobile terminal 100 can synchronise the two networks by shifting the LPRF timing relative to the mobile network. This preferably aligns the timings.

One possible algorithm for determining an allocation pattern such that the 10 mobile terminal does not transmit simultaneously in both networks will now be described. The control unit 80 is informed by the phone unit 62 when the mobile terminal 100 will next transmit and receive in the mobile network 106. Having identified the period of next transmission by the mobile terminal in the mobile network, the control unit 80 can create an allocation pattern by 15 allocating any LPRF time slots which are wholly or partly contemporaneous with this period to transmission by the slave units in the LPRF network, that is reception by the mobile terminal (master unit). The remaining LPRF slots are then allocated to either transmission or reception by the mobile terminal in the LPRF network. Preferably, the LPRF network and mobile network are aligned 20 so that an LPRF time slot begins at the end of the mobile slot in which the mobile terminal transmitted in the mobile network. This LPRF slot is preferably used by the mobile terminal 100 to transmit into the LPRF network.

The master unit (mobile terminal 100) in the LPRF network may or may not 25 be allowed to receive packets when the mobile terminal is transmitting in the mobile network.

The allocation pattern may depend upon the type and number of devices which are active as slave units in the LPRF network. Particular devices may 30 require higher communication rates or real time communication for example.

Referring to Figure 7, three possible allocation patterns 1), 2) and 3) made by the control unit 80 according to the above algorithm are illustrated. The mobile network is a GSM network and in these examples  $N=6$  and  $T=10/12\text{ms}$ . A super-frame comprises 6 LPRF time slots labelled 0 to 5 in the Figure and it spans one GSM time frame. Transmission (down-link, D) in the LPRF network by the mobile terminal during slot 5 is forbidden. In these allocations, the up-link transmission from slave to master unit immediately follows the down-link transmission from master unit to slave. According to the first allocation, in the LPRF network the mobile terminal transmits in slot 0, receives in slot 1, and is otherwise inactive. According to the second allocation, in the LPRF network the mobile terminal transmits in slots 0 and 3 and receives in slots 1 and 4. According to the third allocation, in the LPRF network the mobile terminal transmits a packet, which extends over slots 0 and 1, and another which extends over slots 3 and 4 and receives in slots 2 and 5.

Referring to Figure 8, another allocation made by the control unit 80 is illustrated. The mobile network is a GSM High Speed Circuit Switched Data (HSCSD) 2+2 network and the number of LPRF time slots per GSM time frame is six labelled 0 to 5 in the Figure. In this allocation, the up-link transmission from an addressed slave to the master unit follows two LPRF time slots after the down-link transmission from master unit addressing that slave. Three separate slave units are addressed in slots 0, 1 and 2. Transmission (down-link, D) in the LPRF network by the mobile terminal during slots 4 and 5 is forbidden. In the allocation, in the LPRF network the mobile terminal transmits in slots 0, 1 and 2 and receives in slots 3, 4 and 5.

Referring to Figure 9, another allocation pattern made by the controller 60 is illustrated. The mobile network is a PDC or D-AMPS network and the number

of LPRF time slots per GSM time frame is 26 labelled 1 to 26 in the Figure. Transmission (down-link, D) in the LPRF network by the mobile terminal during slots 18 to 26 is forbidden. In this allocation pattern, the mobile terminal is able to transmit and receive in the LPRF network slots 1 to 17 and  
5 to receive only in slots 18 to 26.

Figure 10 illustrates how the LPRF timing readjust to a change in the timing of the mobile network. In this example the mobile time slot in which the mobile terminal transmits in the mobile network changes from slot 3 to slot 6. This  
10 may occur for example when the mobile terminal is handed over by one base station to another in the mobile network. The resynchronisation of mobile and LPRF networks is achieved by the cellular circuitry 62 informing the control unit 80 which in turn changes the timing of the master transceiver 40 in the mobile terminal 100. The super-frame is shifted by an integer number of  
15 LPRF time slots but the allocation pattern within the super-frame remains unchanged and shifts with the super-frame.

Although a particular implementation of the invention has been described it should be appreciated that the implementation may be varied without  
20 departing from the scope of the invention as defined by the claims. In particular the invention is not limited to the particular mobile networks and LPRF network described.

Claims

1. A terminal for simultaneously operating in a first mobile radio communications network and a second different radio communications network, comprising:
- 5 first radio transceiver means for transmitting and receiving in said mobile communications network and arranged such that successive transmissions by said first transceiver means in said mobile communications network are separated by a first period of time or a multiple thereof; and
- 10 second radio transceiver means for transmitting and receiving packets in the second radio communications network, arranged for transmitting and/or receiving an integer number of packets sequentially in the first period of time or a multiple thereof.
- 15 2. A terminal as claimed in any preceding claim, wherein the second transceiver means controls the second communications network by defining allocation patterns for transmission and/or reception of packets in the second communications network.
- 20 3. A terminal as claimed in claim 2, wherein said allocation patterns controls the timing of transmissions of packets within the second communications network.
- 25 4. A terminal as claimed in claim 3, wherein said allocation patterns controls at what time transceiver units in the second communications network are given access to the network, whether that access is for transmission or reception and the duration of that access.
- 30 5. A terminal as claimed in any one of claims 2 to 4, wherein said allocation patterns avoid predetermined concurrent activities at the terminal.

6. A terminal as claimed in claim 5, wherein said allocation patterns avoids or prevents transmission of packets in the second communication network by the second transceiver means while said first transceiver means is transmitting in the first communications network.

7. A terminal as claimed in any one of claims 2 to 6, wherein said allocation patterns allows the transmission of packets in the second communication network by the second transceiver means only when the first transceiver means is not transmitting in the first communications network.

8. A terminal as claimed in any one of claims 2 to 6, wherein said allocation patterns have a finite length, equal to said first period of time or a multiple thereof, and is cyclically repeated.

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9. A terminal as claimed in claim 8 wherein said length of the allocation patterns are variable, being controlled by said second transceiver means.

10. A terminal as claimed in any one of claims 2 to 9, wherein said allocation patterns are variable being controlled by said second transceiver means.

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11. A terminal as claimed in any preceding claim, wherein the second radio transceiver means is a TDMA transceiver and said first period of time corresponds to a TDMA frame.

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12. A terminal as claimed in any preceding claim, wherein the second radio transceiver defines a common time frame used in the second radio communications network



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13. A terminal as claimed in claim 12, wherein the common time frame comprises a series of slots having the same length, wherein at most one packet is transmitted in the second communications network during each slot.

5 14. A terminal as claimed in claim 13, wherein the length of the slot is such that a first integer number of slots correspond to the first period of time or a multiple thereof.

15 15. A terminal as claimed in claim 14 wherein said first integer number of slots  
10 is an even number of slots.

16. A terminal as claimed in claim 14 or 15, wherein said first integer number of slots is minimum but greater than one.

15 17. A terminal as claimed in claim 13 or any preceding claim when dependent upon claim 13, wherein the length of a slot is such that a second integer number of slots correspond to a second period of time, representing the period of time between successive transmissions in a third mobile radio communications network, or a multiple thereof.

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18. A terminal as claimed in claim 17 wherein said second integer number of slots is an even number of slots.

19. A terminal as claimed in claim 18 wherein said second integer number of  
25 slots is minimum but greater than one.

20. A terminal as claimed in claim 17, wherein the length of the slot is variable depending on the first and/or third communication systems.

21. A terminal as claimed in any one of claims 13 to 19, wherein the length of the slot is fixed.
22. A terminal as claimed in any preceding claim, wherein the second  
5 transceiver means controls the second communications network such that the frequency at which packets are transmitted therein hops with successive slots.
23. A terminal as claimed in claim 11 or any preceding claim when dependent  
10 upon claim 11, comprising means for shifting the common time frame to maintain synchronisation with its activities in the first communications network.
24. A terminal as claimed in any one of the preceding claims, wherein said  
15 first transceiver means is adapted for use in a TDMA system wherein the first period of time corresponds to the length of a TDMA frame.
25. A terminal as claimed in claim 24, wherein said first transceiver means is adapted for use in a GSM, D-AMPS or PDC network.  
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26. A terminal as claimed in any one of the preceding claims wherein each transmission by the first transceiver means does not exceed a predetermined duration.
- 25 27. A terminal as claimed in claim 17 or any preceding claim when dependent upon claim 17, wherein the third transceiver means is adapted for use in a TDMA system, the first period of time corresponding to the length of a TDMA frame.

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28. A terminal as claimed 27, wherein said third transceiver means is adapted for use in a GSM, D-AMPS or PDC network.

29. A first mobile radio communications network comprising a terminal as  
5 claimed in any preceding claim.

30. A terminal substantially as herein before described with reference to and/or as shown in the accompanying drawings.

10 31. A radio communications system comprising a plurality of transceivers synchronised to a common time frame having a succession of equal time slots, wherein a single transceiver transmits in any one time slot, the duration of said time slots being programmable.

15 32. A radio communications system as claimed in claim 31 wherein said programmable duration corresponds to  $20/(13 \cdot K)$  ms or a multiple thereof, where K is a natural number whose value may be programmed.

20 33. A radio communications system comprising a plurality of transceivers synchronised to a common time frame having a succession of equal time slots, wherein a single transceiver transmits in any one time slot, each of said time slots having a duration  $20/(13 \cdot K)$  ms or a multiple thereof, where K is a natural number.

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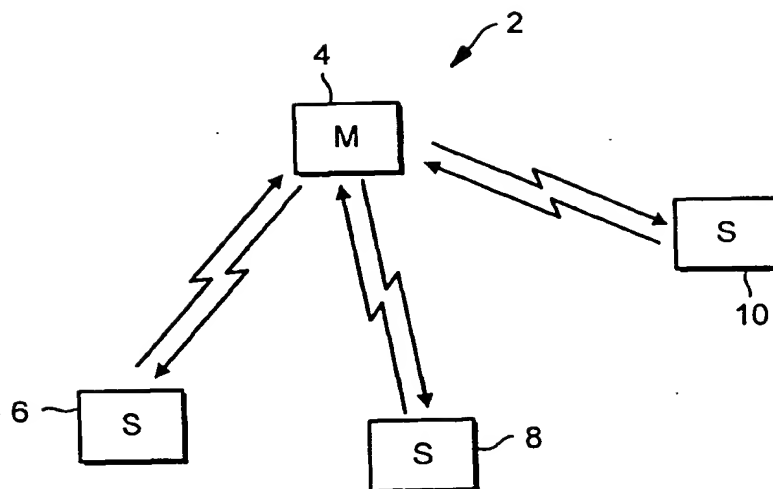


FIG. 1

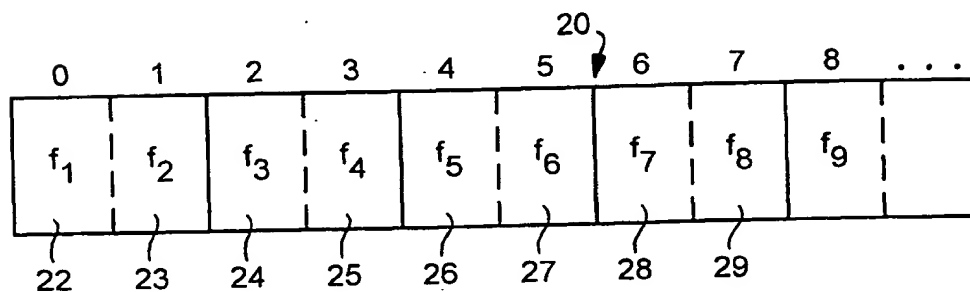


FIG. 2

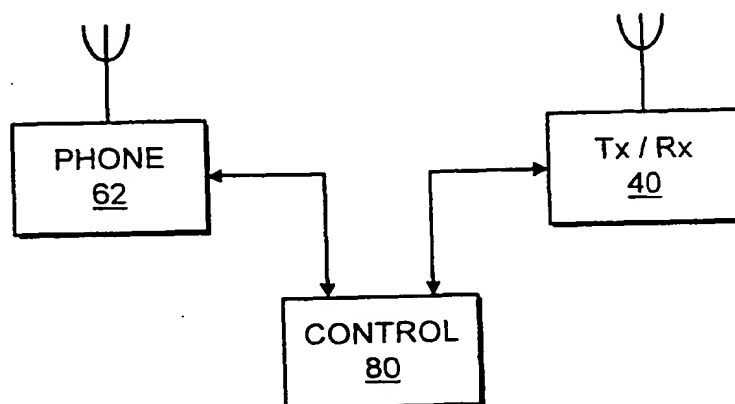


FIG. 4

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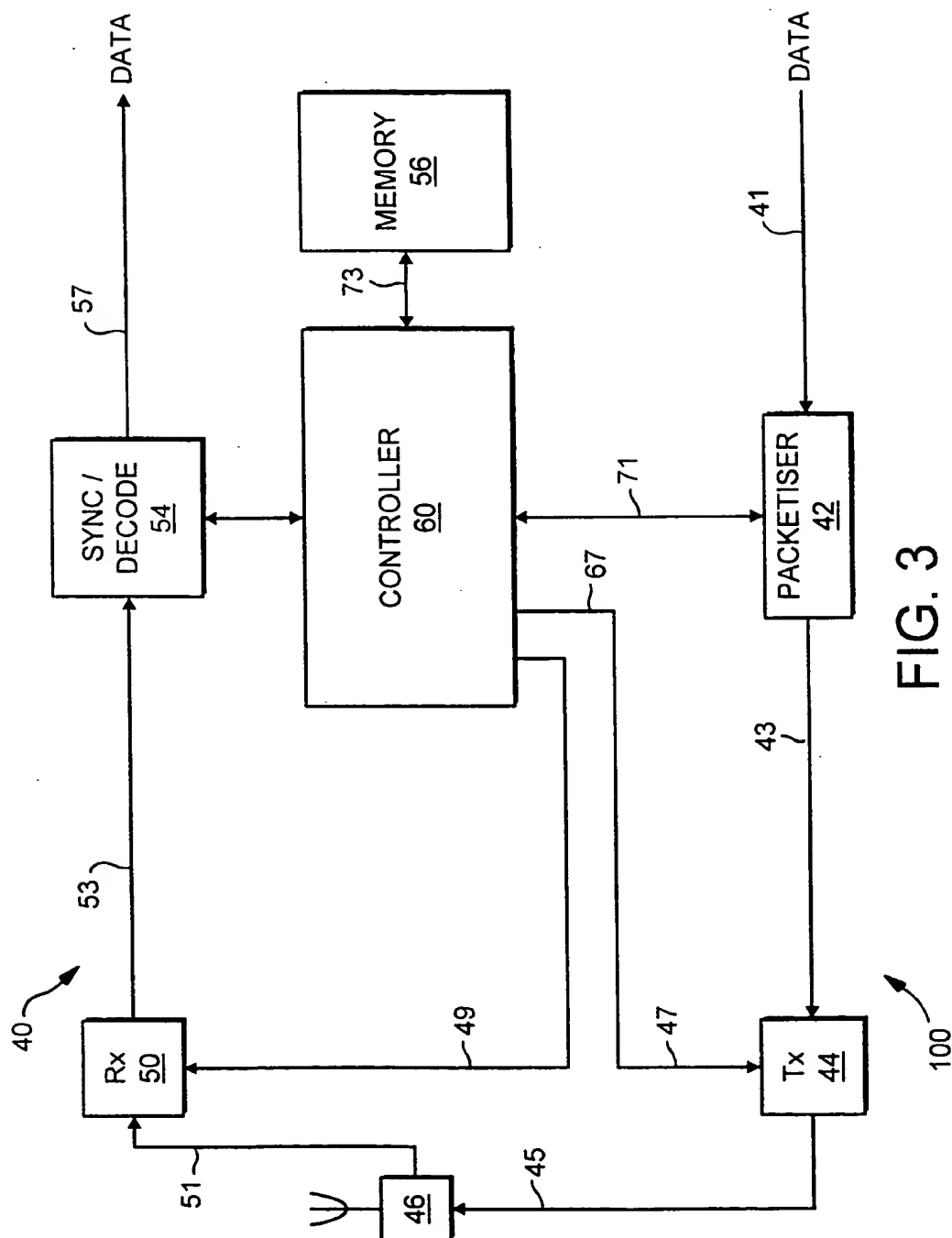


FIG. 3

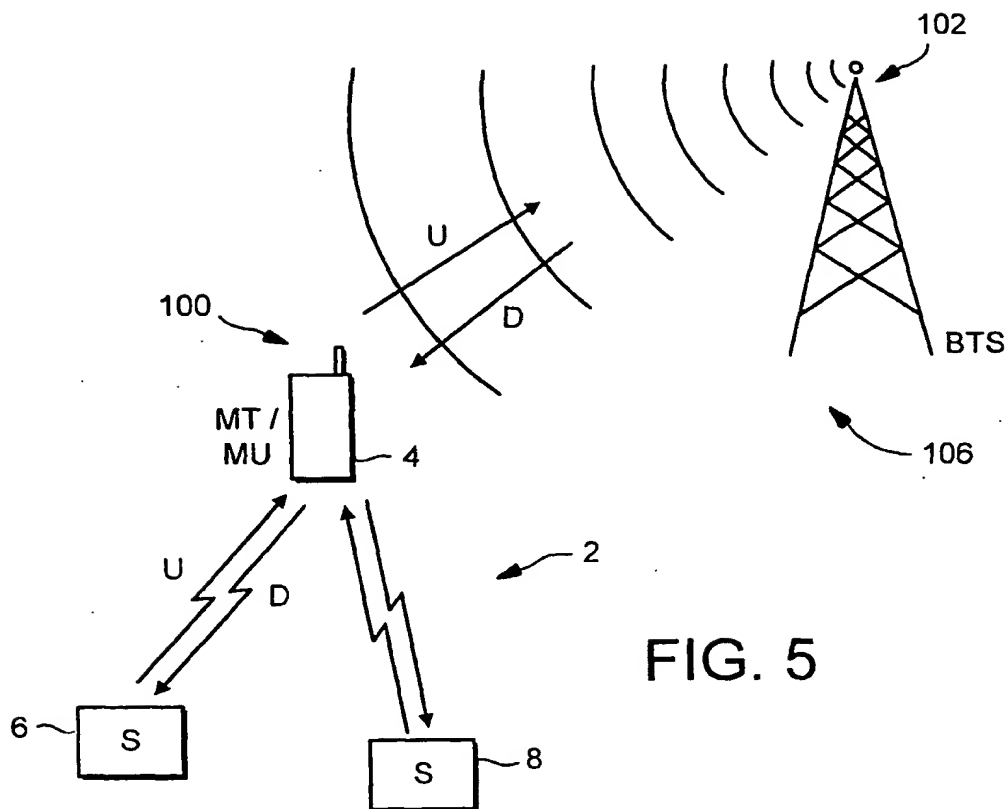


FIG. 5

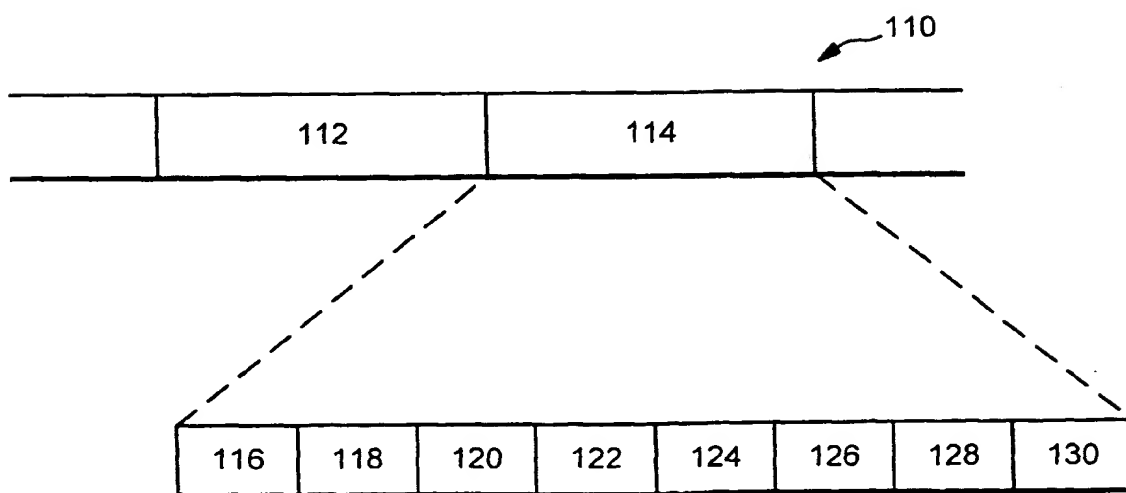


FIG. 6

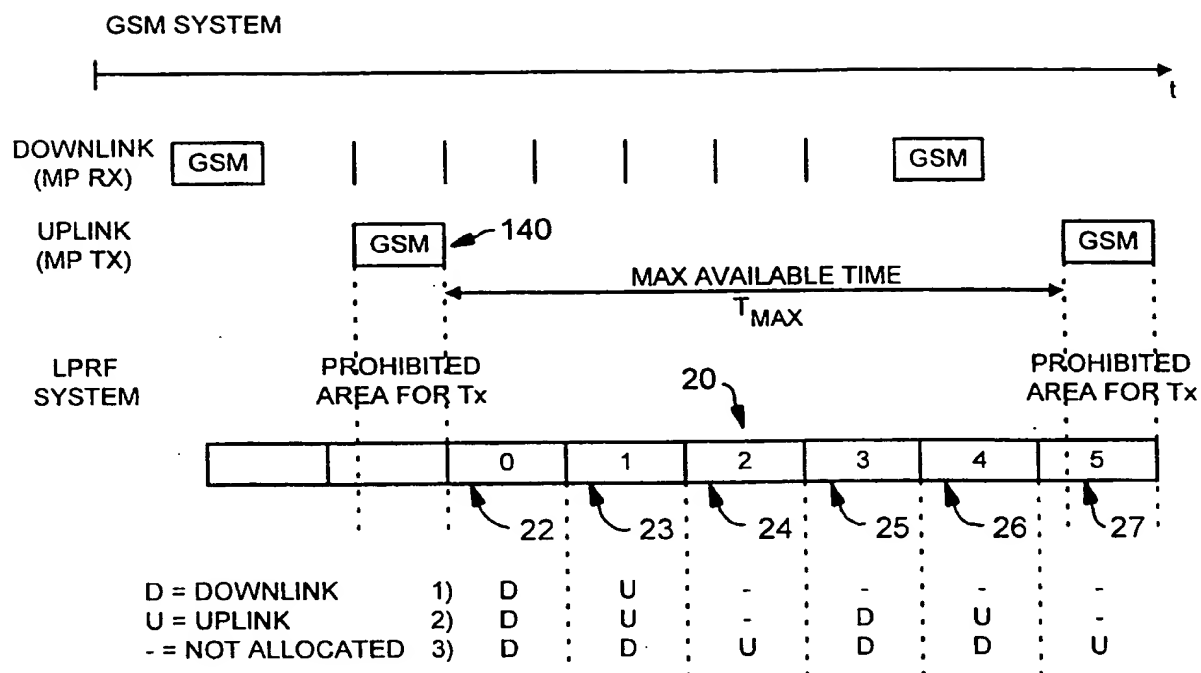


FIG. 7

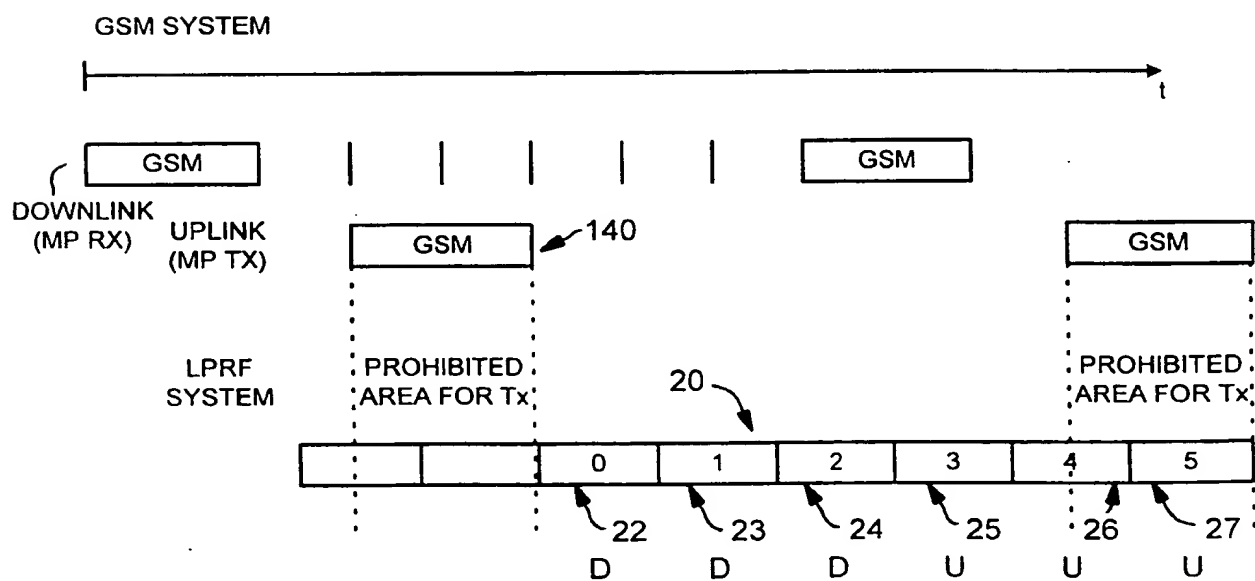
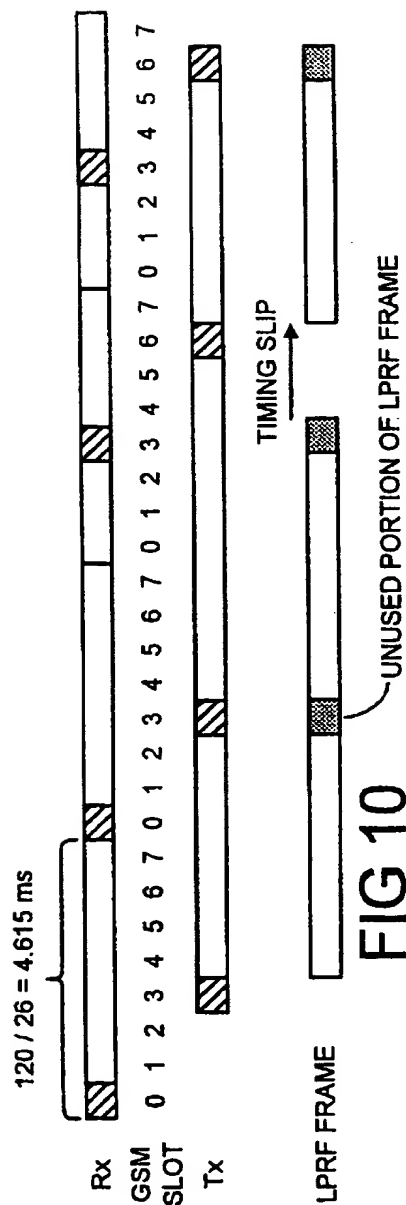
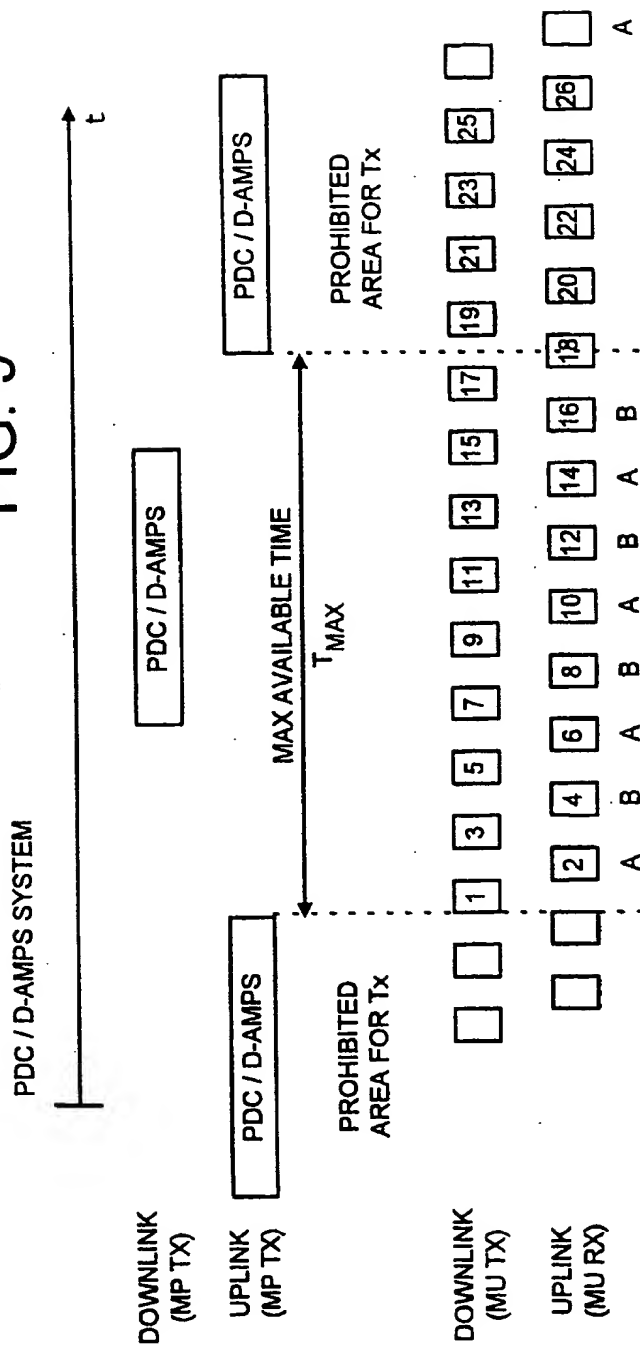


FIG. 8

FIG. 9





## INTERNATIONAL SEARCH REPORT

Inter. Application No

PCT/IB 98/02032

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 681 406 A (NOKIA MOBILE PHONES LTD) 8 November 1995  see abstract see column 5, line 2 - line 12 see column 9, line 2 - line 37 ---	1-4, 10-13, 21, 24, 25, 27-29
A	US 5 521 925 A (LI FAYU ET AL) 28 May 1996  see abstract see column 5, line 3 - line 39 see column 7, line 20 - line 56 see column 8, line 37 - column 9, line 11 see figure 3 --- -/--	1-4, 6, 7, 9-13, 21, 22, 24, 27, 29



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Date of the actual completion of the international search

18 February 1999

Date of mailing of the international search report

24/02/1999

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# INTERNATIONAL SEARCH REPORT

Inte Application No

PCT/18 98/02032

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 96 41491 A (PACIFIC COMM SCIENCES INC)  19 December 1996  see abstract  see page 3, line 7 - line 27  see page 15, line 34 - page 16, line 12  see page 22, line 22 - line 28  see figure 3</p> <p>---</p>	1,5
A	<p>EP 0 711 088 A (TELIA AB) 8 May 1996</p> <p>see column 4, line 56 - column 5, line 10  see figure 4</p> <p>-----</p>	1,11-13, 24,25, 27-29

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Information on patent family members

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